DOCUMENT RESUME

ED 305 365 TM 012 445

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SPONS AGENCY ERIC Clearinghouse on Adult, Career, and Vocational Education, Columbus, Ohio.; Ohio State Univ., Columbus. National Center for Research in Vocational Education.
PUB DATE 9 Aug 88
NOTE 35p.; Also sponsored by the Commission on Testing and Public Policy.
PUB TYPE Reports - Evaluative/Feasibility (142)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS Academic Achievement; *Achievement Tests; Employment Qualifications; *Incentives; Job Applicants; *Job Performance; Labor Market; *Learning Motivation; Measures (Individuals); Motivation Techniques; *Occupational Tests; *Personnel Selection; Predictive Measurement; Vocational Evaluation

ABSTRACT

Employment tests predict job performance because they measure or are correlated with a large set of malleable developed abilities, which are causally related to productivity. Our economy currently under-rewards the achievements that are measured by these tests. Consequently, economic incentives to study hard in high school are minimal, and this absence of incentives has contributed to the low levels of achievement in mathematics and science. Alternative measures of academic achievement include: (1) diplomas; (2) competency profiles; (3) hiring based on high school grades; (4) job tryout and promotions based on performance; (5) job knowledge tests; (6) intelligence tests; and (7) broad spectrum achievement tests. To maximize incentive efforts, students, parents, and teachers must be aware that local employers are using tests for selection and must know what kind of material is included on these tests. Employers should publicize their use of broad spectrum achievement tests. Greater use by employers of tests measuring competence in reading, writing, mathematics, and problem solving will inevitably increase the economic rewards for having such abilities. Two tables and one bar graph complement the text. A 43-item list of references is provided. (SLD)

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EMPLOYMENT TESTING AND INCENTIVES TO LEARN

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Working Paper # 88-12

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This paper is to appear shortly in a special issue of the Journal of Vocational Behavior edited by Linda Gottfredson and James Sharf. The research that has culminated in this paper was sponsored by the Center for Advanced Human Resource Studies, the National Center for Research in Vocational Education and the Commission on Testing and Public Policy. I would like to thank Peter Mueser for helpful comments on earlier versions of the paper. The opinions and conclusions expressed herein are solely those of the author and should not be construed as representing the opinions or policies of any agency of the United States Government. This paper has not undergone formal review or approval of the faculty of the ILR school. It is intended to make results of Center research available to others interested in human resource management in preliminary form to encourage discussion and suggestions.

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ABSTRACT

Employment tests predict job performance because they measure or are correlated with a large set of malleable developed abilities which are causally related to productivity. Our economy currently under-rewards the achievements that are measured by these tests. Consequently, economic incentives to study hard in high school are minimal and this absence of incentives has contributed to the low levels of achievement in math and science. The paper concludes with a discussion of ways in which employment tests can strengthen incentives to learn.

8/9/88

EMPLOYMENT TESTING AND INCENTIVES TO LEARN

Employment testing appears to be destined to have a growing role in the allocation of workers to jobs. The legal impediments to the use of aptitude tests appear to be diminishing (Sharf 1988). Even if the trend of court decisions accepting the claims of validity generalization were to be reversed, employers and society can gain most of the benefits of improved selection by top down hiring from a ranking generated by race normed test scores (Schmidt 1988; Wigdor and Hartigan 1988). As a result, there is no necessary conflict between minority interests and greater use of tests in employment selection. As a result, test use appears to be growing. A 1985 American Society for Personnel Administration survey found that 24 percent of the firms responding had increased testing in the past year and another 44 percent were considering an increase in the amount of testing they do.

Greater use of employment tests will have major effects on the economy. The most obvious effect of testing is the impact on the sorting of workers across jobs and occupations. The literature reviewed in Hunter (1986) and Schmidt (1988) indicates that employment tests yield information on the probable job performance of job applicants that is not available from other sources. If a trait measured by a test has a larger effect on dollars of output in occupation A than in occupation B, recruiting people who do well on the test into occupation A will increase national output. Hunter and Schmidt (1982) present a simple method for calculating this effect. They calculate that if all workers were distributed across four major occupational categories on the basis of a single test score, national income would be 4 percent higher than it would be under random assignment of workers to major occupational category. However, since people are already recruited into high

status jobs on the basis of years of schooling, SAT scores, college major, grades and performance in past jobs (which as a group can explain much of the variance of test scores), greater use of tests by employers would probably have much smaller effects on national output than those calculated by Hunter and Schmidt. In other respects, however, their calculation of sorting effects may understate the effects of greater test use on national productivity, so it is not clear what would emerge from a calculation based on a more complicated and realistic model.

The second way in which employment testing affects national output is its impact on incentives to develop the skills and competencies measured by the test. In my view, employment tests measuring verbal and mathematical ability predict job performance because they measure or are correlated with a large set of malleable developed abilities which are causally related to productivity and the ability to learn new job specific skills. Adoption studies have found that children adopted by upper middle class parents have significantly higher IQ and academic achievement than the siblings who remain with their lower class parents (Schiff et al 1978, 1982, Dumaret 1985, Duyme 1985). Other studies have shown that school attendance raises scores on these aptitude tests (Lorge 1945; Husen 1951; Department of Labor 1970) and that taking a rigorous college prep curriculum increases the gains on these tests between sophomore and senior years of high school (Bishop 1985; Hotchkiss 1985). In recognition of the fact that aptitude test scores are significantly influenced by educational background, the College Board describes the SAT as a measure of "developed verbal and mathematical reasoning abilities (1987, p. 3)"

This short note is not the place for a thorough review of the evidence regarding just how malleable these developed abilities are. Since, however, it relates directly to Gottfredson's paper in this volume, I will discuss the malleability of racial differences in academic achievement and IQ. Gottfredson (1988) argues that racial differentials in IQ are very stubborn and that, consequently, color blind use of employment tests will probably have an adverse impact on blacks for generations. Citing Gordon (in press), she reports that the IQ gap between whites and blacks has been relatively stable ever since 1918. Since mean IQ levels of the entire population rose more than 15 points between 1918 and 1968 (Tuddenham 1948, Flynn 1984), this implies that the mean IQ of blacks rose as well. The failure of the gap to close during the first 50 years of IQ testing takes on much less significance when one realizes that both groups were rapidly improving.

In more recent data, however, the gap is closing. Blacks born after the civil rights revolution are doing much better in school than those born prior to 1960. The evidence is presented in Table 1. In the first National Assessment of Educational Progress black high school seniors born around 1954 were 5.3 grade level equivalents behind their white counterparts in reading proficiency. In the first assessment of math skills, black high school seniors born around 1957 were 4 grade level equivalents behind in mathematics. The most recent National Assessment data for 1986 reveals that the gap in math proficiency has been cut to 2.9 grade level equivalents in just 12 years and that the reading gap has been cut to 2.6 years in just 15 years. Koretz's (1986 Appendix E) analysis of data from state testing programs supports the NAEP findings. Gains of this magnitude contradict Gottfredson's pessimistic assessment and suggest that Head Start, Title I and other compensatory

Table 1

Racial Gap in Reading and Math Proficiency

[In Grade Equivalent Units]

	Test Date							
	1971	1973	1975	1978	1980	1982	1984	1986
Reading								
At Age 17	5.3	--	5.0	--	4.8	--	3.3	2.6
At Age 13	4.2	--	3.9	--	3.3	--	2.8	2.3
Math								
At Age 17	--	4.0	--	3.8	--	3.2	--	2.9
At Age 13	--	4.6	--	4.2	--	3.4	--	2.4

Source: National Assessment of Educational Progress, The Reading Report Card. 1985, Data Appendix and Who Reads Best?, February 1988, Table 1.1. The difference between the scores of 17 year olds and 9 year olds was 75 points on the NAEP scale used in the report covering 1971 through 1984 and 18 on the scale used in the report on the 1986 assessment. Consequently, a grade equivalent unit was defined as 9.375 points on the NAEP scale used in the 1971-84 report and 2.25 points on the scale used in the report on the 1986 assessment. The Mathematics Report Card. June 1988, Figure 1.2. The difference between the scores of 17 year olds and 9 year olds was 80.3 points on the NAEP scale. Consequently, a grade equivalent unit was defined as 10 points on the NAEP scale.

interventions are having an impact. The schools attended by most black students are still clearly inferior to those attended by white students so further reductions in the school quality differentials will probably produce further reductions in academic achievement differentials. Consequently, it is my view that there is reason to expect that further expansions and improvements of Head Start and compensatory education can just about eliminate the racial gap in academic achievement for youngsters from similar socio-economic backgrounds.

Greater use by employers of tests measuring competence in reading, writing, mathematics and problem solving will inevitably increase the economic rewards for having these abilities. If as argued above the developed abilities measured by these tests are trainable, their supply will increase as young people respond to the improved incentives and devote more time and energy to learning. In my judgement, the effects of testing on the aggregate supply of skilled workers may be considerably more important than its sorting effects. This judgement follows from three propositions which will be defended below:

1. The labor market under-rewards the developed abilities measured by these tests.
2. Young people would devote more time and energy to developing these abilities if the rewards were greater.
3. Greater use of employment tests measuring a broad range of cognitive achievements such as the ASVAB would both increase validity of employment selection and improve the economic rewards for learning.

The first of these propositions is defended in the section 1. The minimal use of tests of academic achievement or credentials based on them as devices for selecting employees is in large part responsible for the failure of the

labor market to appropriately reward effort and achievement in high school. The second section of the paper presents evidence for proposition # 2. It examines incentives to study hard in high school, and presents evidence that more powerful labor market rewards for learning are needed to strengthen these incentives. The final section of the paper defends proposition # 3. It presents evidence that employment tests that measure verbal and mathematical ability only such as the G aptitude of the GATB are less valid than broad spectrum achievement tests like the ASVAB which measure scientific, technical and mechanical achievements as well. It concludes with recommendations for how employment tests can contribute to strengthening incentives to learn.

I. The Absence of Major Economic Rewards for Effort in High School

The decline in test scores and the poor performance of American students on international mathematics and science tests has stimulated a great deal of concern about the quality of education. An educational reform movement has developed that is attempting to add rigor to the curriculum and improve teaching. These are important objectives, and some progress has been made. If, however, students are not motivated to study harder, the reform initiatives will fail. Too little attention has been given to student motivation. In the area of student motivation, employment testing potentially has an important role to play.

Studies of time use and time on task in high school show that students actively engage in a learning activity for only about half the time they are scheduled to be in school. In 1980, high school students spent an average of 3.5 hours per week on homework. When homework is added to engaged time at school, the total time devoted to study, instruction, and practice is only 20 hours per week. By comparison, the typical senior spent 10 hours per

week in a part-time job and nearly 25 hours watching television. Thus, TV occupies more of an adolescents time than learning.

Even more important is the intensity of the student's involvement in the process. Theodore Sizer described American high school students as **"docile, compliant, and without initiative"** (Sizer 1984). Coming to the same conclusion, John Goodlad observed, "the extraordinary degree of student passivity stands out" (Goodlad 1984). When teachers are asked what they feel are the most important problems in education, more than 40% respond, "lack of interest by students". This lack of interest makes it very difficult for teachers to be demanding.

Some teachers are able to overcome the obstacles and induce their students to undertake hard learning tasks. But for most mortals the lassitude of the students is too demoralizing. In too many classrooms an implicit agreement prevails in which the students trade civility for lowered academic demands (Sizer 1984). We assign teachers the responsibility for setting high standards, but we do not give them any effective means except the force of their own personality for inducing student acceptance of the academic goals of the classroom. Most students view the costs of studying hard as much greater than the benefits, so the peer group pressures the teacher to go easy. All too often teachers are forced to compromise their academic demands. In the current institutional environment, one cannot realistically expect to identify and attract enough gifted teachers to solve the motivation problem.

But students are not the only group that is apathetic. Stevenson, Lee and Stigler's (1986) study of education in Taiwan, Japan and the U.S. found that even though American children were learning the least in school, American parents were the most satisfied with the performance of their local schools.

Why do Japanese and Taiwanese parents hold their children and their schools to a higher standard than American parents?

The fundamental cause of the apathy and motivation problem is the way we recognize and reinforce student effort and achievement. The educational decisions of students and their parents are significantly influenced by the costs (in money, time and psychological effort) and benefits (praise, prestige, employment, wage rates, and job satisfaction) that result. The problem is that while there are benefits to staying in high school, most students do not benefit very much from working hard while in high school. This is in large measure a consequence of the failure of the labor market to reward effort and achievement in high school.

Students who plan to look for a job immediately after high school generally see very little connection between their academic studies and their future success in the labor market. Statistical studies of the youth labor market confirm their skepticism about the economic benefits of studying hard:

- For high school students, high school grades and performance on academic achievement/aptitude tests have essentially no impact on labor market success. They have -
  - --no effect on the chances of finding work when one is seeking it during high school, and
  - --no effect on the wage rate of the jobs obtained while in high school.(Hotchkiss, Bishop and Gardner 1982)
- As one can see in table 2, for those who do not go to college full-time, high school grades and test scores had -
  - --no effect on the wage rate of the jobs obtained immediately after

Table 2

Effect of Academic Achievement
on the Wage Rates of High School Graduates

Study and Data Set	Date of Graduation	Age	Achievement Measures	Percent Change in Wage Rate Male	Female
Wage Rates					
Kang & Bishop (1985)	1980	19	Test-Math,Voc,Read	-1.9	-.5
High School & Beyond			GPA in Grade 12	.6	2.2
Gardner (1983)	1976-1982	19-24	AFQT	4.8	4.8
NLS Youth					
Daymont & Rumberger	1976-1979	19-21	GPA in Grade 9	.3	2.7
NLS Youth (1982)					
Meyer (1982)	1972	19	Class Rank Grade 12	0.0	2.5
(Weekly earnings)			Test Composite	1.2	2.2
Class of 1972					
Earnings					
Hause (1975)	1961	19	IQ,Test-Math	-3.7	--
Project Talent (white)		23	IQ,Test-Math	6.1	--

The table reports the percentage response of the wage rate or earnings to a one standard deviation improvement in a measure of academic achievement. For high school seniors a one standard deviation differential on an achievement test is about equal to 3.5 grade level equivalents or 110 points on the Verbal SAT. For GPA, one standard deviation is about .7 when C's = 2.0, B's = 3.0 and A's = 4.0.

high school in Kang and Bishop's (1985) analysis of High School and Beyond seniors and only a 1 to 4.7 percent increase in wages per standard deviation (SD) improvement in test scores and grade point average in Meyer's (1982) analysis of Class of 1972 data.

--a moderate effect on wage rates and earnings after 4 or 5 years [Gardner (1982) found an effect of 4.8 percent per SD of achievement and Meyer (1983) found an effect of 4.3 to 6.0 percent per SD of achievement],

--a small effect on employment and earnings immediately after high school.

- In almost all entry-level jobs, wage rates reflect the level of the job not the worker's productivity. Thus, the employer, not the worker, benefits from a worker's greater productivity. Cognitive abilities and productivity make promotion more likely, but it takes time for the imperfect sorting process to assign a particularly able worker a job that fully uses that greater ability -- and pays accordingly.

The long delay before labor market rewards are received is important because most teenagers are "now" oriented, so benefits promised for 10 years in the future may have little influence on their decisions.

Although the economic benefits of higher achievement are quite modest for young workers and do not become really substantial until long after graduation, the benefits to the employer (and therefore, to national production) are immediately apparent in higher productivity. This is the implication of the finding that tests of reading, mathematics, problem solving ability and familiarity with scientific and technical matters are valid predictors of job performance in most jobs.

Studies that measure output for different workers in the same job at the same firm, using physical output as a criterion, have found that the standard deviation of output varies with job complexity and averages about .164 in routine clerical jobs and .278 in clerical jobs with decision making responsibilities (Hunter, Schmidt and Judiesch 1988). Since there are fixed costs to employing an individual (facilities, equipment, light, heat and overhead functions such as hiring and payrolling), the coefficient of variation of marginal products of individuals will be considerably greater (Klein, Spady, and Weiss 1983). On the assumption that the coefficient of variation of marginal productivity for clerical jobs is 30 percent [1.5*(.33*.278+.67*.164)], a .5 validity for general mental ability implies that an academic achievement differential between two individuals of one standard deviation (in a distribution of high school graduates) is associated with a productivity differential in the job of about 11 percent (.5*.74*30% where .74 is the ratio of the high school graduate test score standard deviation to the population standard deviation.

Figure 1 compares the percentage effect of mathematical and verbal achievement (specifically a one standard deviation difference in GPA and/or test scores) on the productivity of a clerical worker, on wages of male clerical workers (from Taubman and Wales 1975), and on the wages of young women who have not gone to college (from Kang and Bishop 1985 and Meyer 1982). Productivity clearly increases much more than wage rates. Apparently it is a youth's employer, not the youth, who benefits the most when a non-college-bound student works hard in school and improves his or her academic achievements. The youth is more likely to find a job, but not one with an

IMPACT OF ACADEMIC ACHIEVEMENT

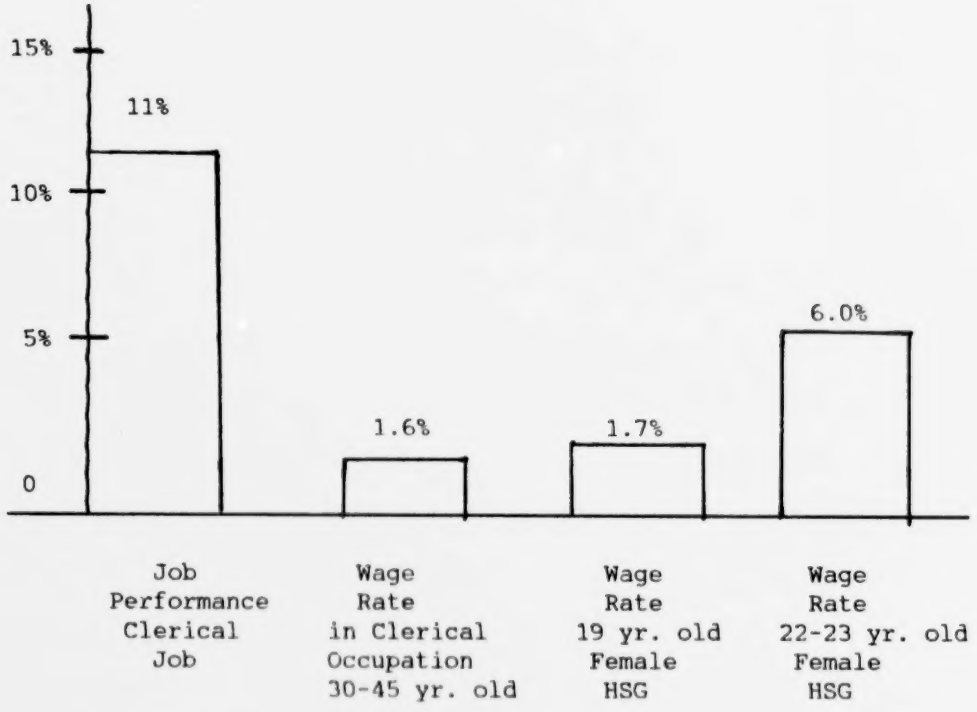

Figure 1

appreciably higher wage. The next sub-section examines reasons for the discrepancy.

Reasons for the Discrepancy between Wage Rates and Productivity on the Job

Employers are presumably competing for better workers. Why doesn't competition result in much higher wages for those who achieve in high school and have strong basic skills? The cause appears to be the lack of objective information available to employers on applicant accomplishments, skills, and productivity.

A 1987 survey of a stratified random sample of small and medium sized employers who were members of the National Federation of Independent Business (NFIB) found that aptitude test scores had been obtained in only 3.15 percent of the hiring decisions studied (Bishop and Griffin 1988). Top down hiring on the basis test scores is even more unusual. Prior to 1971, the use of aptitude tests was much more extensive. The cause of this change was the fear of costly litigation over the business necessity and validity of aptitude tests. The EEOC's codification of the APA's professional testing standards and its theory of situational and subgroup differences in validity into federal law made the required validation studies so costly it discouraged almost all employers from undertaking the effort.

Other potential sources of information on effort and achievement in high school are transcripts and referrals from teachers who know the applicant. Both these means are under used. In the NFIB survey, transcripts had been obtained prior to the selection decision for only 13.7 percent of the hiring events in which someone with 12 or fewer years of schooling was hired. If a student or graduate has given written permission for a transcript to be sent to an employer, the Buckley amendment obligates the school to respond.

Many high schools are not, however, responding to such requests. The experience of Nationwide Insurance, one of Columbus, Ohio's most respected employers, is probably representative of what happens in most communities. The company obtains permission to get high school records from all young people who interview for a job. It sent over 1,200 such signed requests to high schools in 1982 and received only 93 responses. Employers reported that colleges were much more responsive to transcript requests than high schools. High schools have apparently designed their systems for responding to requests for transcripts around the needs of college bound students not around the needs of the students who seek a job immediately after graduating.

There is an additional barrier to the use of high school transcripts in selecting new employees--when high schools do respond, it takes a great deal of time. For Nationwide Insurance the response almost invariably took more than 2 weeks. Given this time lag, if employers required transcripts prior to making hiring selections, a job offer could not be made until a month or so after an application had been received. Most jobs are filled much more rapidly than that. A survey of 3500 employers in 1982 conducted by the National Center for Research in Vocational Education found that 83.5 percent of all jobs were filled in less than a month, and 65 percent were filled in less than 2 weeks.

The only information about school experiences requested by most employers is years of schooling, diplomas and certificates obtained, and area of specialization. Probably because of unreliable reporting and the threat of EEOC litigation, only 16 percent of the NFIB employers asked the applicants with 12 or fewer years of schooling to report their grade point average. Hiring on the basis of recommendations by high school teachers is also

uncommon. In the NFIB survey, when someone with 12 or fewer years of schooling was hired, the new hire had been referred or recommended by vocational teachers only 5.5 percent of the time and referred by someone else in the high school only 3.1 percent of the time.

Consequently, hiring selections and starting wage rates often do not reflect the competencies and abilities students have developed in school. Instead, hiring decisions are based on observable characteristics (such as years of schooling and field of study) that serve as signals for the competencies the employer cannot observe directly. As a result, the worker's wage reflects the average productivity of all workers with the same set of educational credentials rather than that individual's productivity or academic achievement.

This evidence implies that the social benefits of developing one's verbal, mathematical and scientific capabilities are considerably greater than the private rewards. Despite their higher productivity, young workers who have achieved in high school and who have done well on academic achievement tests do not receive higher wage rates immediately after high school. The student who works hard must wait many years to start really benefiting and even then the magnitude of the wage and earnings effect--a 1 to 2 percent increase in earnings per grade level equivalent on achievement tests--is considerably smaller than the actual change in productivity that results.

II. Will Larger Economic Rewards for Learning Induce Students to Study Harder ?

Learning that is certified by a credential is rewarded handsomely. The magnitude of the earnings payoff to a credential has been shown to have significant effects on the numbers of students entering college and choosing

specific majors (Freeman 1971, 1976). Learning not certified by a credential is either not rewarded or only modestly rewarded. Consequently, there are strong incentives to stay in school; but much weaker incentives to study hard while in school. If students are to be motivated to devote more time and energy to learning, they must believe their effort will be rewarded. If parents are to be induced to demand better schools and to spend the time supervising homework, they too must believe that better teaching, a more rigorous curriculum and hard study produces learning which will be rewarded in the labor market. When, however, the only signals of learning accomplishment that are available--eg. GPA and rank in class--describe one's performance relative to close friends, the motivation to study and to demand better schools is undermined.

The Zero-Sum Nature of Academic Competition in High School

The second root cause of the lack of real motivation to learn is peer pressure against studying hard. Students report that "in most of the regular classes... If you raise your hand more than twice in a class, you are called a 'teachers pet.'" Its OK to be smart, you cannot help that. It is definitely not OK to study hard to get a good grade. An important reason for this peer pressure is that the academic side of school forces adolescents to compete against close friends. Their achievement is not being measured against an absolute or an external standard. In contrast to scout merit badges where recognition is given for achieving a fixed standard of competence, the only measures of achievement that receive attention in American schools are measures of one's performance relative to one's close friends such as grades and rank in class. When students try hard and excel in school, they are making things worse for friends. When we set up a zero sum competition among close friends,

we should not be surprised when they decide not to compete. All work groups have ways of sanctioning "rate busters." High school students call them "brain geeks", "grade grubbers" and "brown nosers".

Adolescents are not lazy. In their jobs after school and at football practice they work very hard. In these environments they are not competing against each other. They are working together as part of a team. Their individual efforts are visible to their peers and appreciated by them. On the sports field, there is no greater sin than giving up, even when the score is hopelessly one sided. In too many high schools, when it comes to academics, there is no greater sin than trying hard.

Another reason for peer norms against studying is that most students perceive the chance of receiving recognition for an academic achievement to be so slim they have given up trying. At most high school awards ceremonies the recognition and awards go to only a few--those at the very top of the class. By 9th grade most students are already so far behind the leaders, that they know they have no realistic chance of being perceived as academically successful. Their reaction is often to denigrate the students who take learning seriously and to honor other forms of achievement--athletics, dating, holding your liquor and being "cool"--which offer them better chances of success.

The lack of standards for judging academic achievement that do not involve comparisons with one's close friends and the resulting zero sum nature of academic competition also influences the school board and the political system. Parents can see that setting higher academic standards or hiring better teachers will not improve their child's grade point average or rank in class. Since the Scholastic Aptitude Test is intended to be curriculum

free, adding rigorous science, history and calculus courses to the curriculum is unlikely to change SAT scores. In any case, doing well on the SAT matters only for those who aspire to attend a small number of highly selective colleges. The parents of children not planning to go to college have an even weaker incentive to demand high standards. They believe that what counts in the labor market is getting the diploma not learning algebra (and they happen to be right). Higher standards might put at risk what is really important--the diploma.

The real costs of mediocre schools become apparent only to employers and to officials at higher levels of government. The whole community loses because the work force is less efficient and it becomes difficult to attract new industry. This is precisely the reason why employers, governors and state legislatures have been the energizing force of school reform. State governments, however, are far removed from the classroom and the instruments available to them for imposing reform are limited. If students, parents and school board officials perceive the rewards for learning to be minimal, state efforts to improve the quality of education will not succeed.

Evidence of a Learning Response to Economic Incentives

The tendency to under-reward effort and learning in school appears to be a peculiarly American phenomenon. Grades in school are a crucial determinant of which employer a German youth apprentices with. Top companies in Japan and Europe often hire lifetime employees directly out of secondary school. Teacher recommendations, grades in school, and scores on national and provincial exams have a significant impact on who gets to work at the more prestigious firms (Leestma, et. al., 1987). Japanese parents know that their son or daughter's future economic and social rank in society critically

depends on how much he or she learns in secondary school. Furthermore, learning achievement tends to be defined and measured relative to everyone else in the state or nation and not just relative to one's classmates in the school. Entry into the better high schools depends primarily on the child's performance in junior high school, not on where the parents can afford to live as occurs in the US. These are the reasons why Japanese parents demand so much of their children and of their schools. This is why Japanese 5th graders spend 32.6 hours a week involved in academic activities while American youngsters devote only 19.6 hours to their studies (Stevenson, Lee and Stigler 1986).

Japanese adolescents work extremely hard in high school, but once they have entered college, they stop working. For most students a country club atmosphere prevails. The reason for the change in behavior is that employers apparently care only about which university the youth attends, not about the individual's academic achievement at the university. Working hard is not a national character trait, it is a response to the way Japanese society rewards academic achievement.

American students, in contrast, take it easy in high school but generally work quite hard in college. This change is due, in part, to the fact that academic achievement in college has important effects on labor market success. When higher level jobs requiring a bachelors or associates degree are being filled, employers pay much more attention to grades and teacher recommendations than when they hire high school graduates. The NFIB survey found that when someone with 16 or more years of schooling was hired, 26 percent of the employers had reviewed the college transcript before making the selection, 7.8 percent had obtained a recommendation from a major professor and 6.3

percent had obtained a recommendation from a professor outside of the graduates major or from the colleges's placement office.

III. Structuring Signals of Academic Achievement to Maximize Incentive Effects

The foregoing analysis implies that student incentives to learn and parental incentives to demand a quality education are maximized when the following is true: (1) significant economic rewards depend directly and visibly on academic accomplishments, (2) the accomplishment is defined relative to an externally imposed standard of achievement and not relative to one's classmates, (3) the reward is received immediately, (4) everyone, including those who begin high school with serious academic deficiencies, has an achievable goal which will generate a significant reward and (5) progress toward the goal can be monitored by the student, parents and teacher. It is not easy to design a system of signaling and certifying academic achievement which satisfies all of these requirements. Consequently, it will generally be desireable to simultaneously use more than one signal of academic achievement. Let us examine the alternatives.

Diplomas:

The standard high school diploma satisfies requirement 2, 3, 4 and 5 but it fails to satisfy requirement # 1, the most critical requirement of all. Minimum competency tests for receiving a high school diploma are an improvement, for they are an example of an externally imposed standard of achievement. They are a step in the right direction, especially when they are taken early in high school, and remedial classes are offered after school and during the summer for those who fail on the first try. However, some students arrive in high school so far behind that setting a high minimum would

cause many to give up trying. Consequently, the minimum standard is not set very high and fails to challenge most students.

Competency Profiles:

Competency profiles are check lists of competencies that a student has developed through study and practice. The ratings of competence that appear on a competency profile are relative to an absolute standard, not relative to other students in the class. By evaluating students against an absolute standard, the competency profile prevents one student's effort from negatively affecting the grades received by other students. It encourages students to share their knowledge and teach each other.

A second advantage of the competency profile approach to evaluation is that students can see their progress as new skills are learned and checked off. The skills not yet checked off are the learning goals for the future. Seeing such a check list getting filled up is inherently reinforcing.

With a competency profile system, goals can be tailored to the student's interests and capabilities, and progress toward these goals can be monitored and rewarded. Students who have difficulty in their required academic subjects can, nevertheless, take pride in the occupational competencies that they are developing and which are now recognized just as prominently as course grades in academic subjects. Upon graduation, the competency profile would be encased in plastic and serve as a credential certifying occupational competencies. If the ratings by teachers (and the sponsoring employers of cooperative education students) are reliable indicators of competence, employers will find this information very valuable, and the students who build a good record will be handsomely rewarded.

Hiring Based on Grades in High School:

Using grades to select new hires results in a very visible dependence of labor market outcomes on an indicator of academic accomplishment. There are, however, two disadvantages. It results in zero-sum competition between classmates and consequently contributes to peer pressure against studying and parental apathy about the quality of teaching and the rigor of the curriculum. The second problem is that it induces students to select easy courses and teachers to go easy in their grading. These problems can be mitigated somewhat if employers take the rigor of courses into account when evaluating grades, give preference to schools with tough grading standards, and vary the number hired from particular schools in response to the actual job performance of past hires from that school. From the employer's point of view, the disadvantage of high school GPA is that it is difficult to adjust these grades for the grading standards of the school and without such adjustment grades have rather low validity.

Job Tryout and Promotions Based on Performance:

From the point of view of motivating students to study, the problem with job tryout and performance reward systems is that the dependence of labor market outcomes on academic achievements is both invisible and considerably delayed. From the employer's point of view, the disadvantages of job tryout are the costs of training workers who end up being fired, its unpopularity with workers who will spend months unemployed if they are fired, and its potential for generating grievances. Performance evaluations are known to be unreliable, and this makes workers reluctant to take jobs in which next year's pay is highly contingent on one supervisor's opinion. Pay that is highly contingent on performance can also weaken cooperation and generate

incentives to sabotage others. The benefits of performance reward systems are that they motivate better performance, they tend to attract high performers to the firm, and they tend to induce the high performers to stay at the firm. When these factors are balanced, it appears that most workers and employers choose compensation schemes in which differentials in relative productivity result in relatively small wage differentials (Bishop 1987).

Job Knowledge Tests:

From the point of view of learning incentives, the disadvantage of job knowledge tests is that they do not generate incentives to study math, science, history and literature and may induce students to over-specialize in school. They are left high and dry if they can not obtain a job in the field for which they prepared. From the employer's point of view, job knowledge tests are appropriate if there is a pool of already trained workers available and there is no intention of eventually promoting the people selected into jobs requiring a different set of skills. Job knowledge tests are less useful if the pool of job applicants has no experience in the field. The possibility of court challenges complicates matters here for validity generalization may not apply, and each job knowledge test may have to stand on its own merits. Development costs are high, so small occupations may never have job knowledge tests developed for them.

IQ Tests:

Students, parents and teachers view IQ tests as measuring something that schools do not teach. Even though this public perception is not really correct, the perception is not likely to change in the near future, so hiring on the basis of IQ tests fails requirement # 1. As Jencks and Crouse (1982) have already pointed out with respect to SAT tests, students will not see

the connection between how hard they study and higher IQ scores. From the employer's point of view, the problems with using IQ tests to select workers are (1) that individually administered IQ tests are too expensive and cannot be made secure, (2) paper and pencil IQ tests like GATB's G aptitude contain spatial relations subtests which contribute little to validity and have adverse impact on women and (3) IQ tests are less valid than broad spectrum achievement tests such as the ASVAB which emphasize fields of knowledge that are useful in the job.

Broad Spectrum Achievement Tests:

From the point of view of incentives to study a broad range of academic subjects, broad spectrum achievement tests such as the ASVAB are the best of all the alternatives reviewed. If some of the subtests in the battery include material covered in the standard college prep high school curriculum such as algebra, statistics, chemistry, physics and computers, the use of such tests for selection would generate parental pressure for an upgraded curriculum and encourage high school students to take more rigorous courses. When employers offering the better jobs use achievement tests to select new employees, everyone who wants a good job faces a strong incentive to study, and those not planning to go to college will find the incentive especially strong. The best paying firms will find they can set higher test score cutoffs than low paying firms, so the reward for learning will become continuous. Whether one begins 9th grade way behind or way ahead, there will be a benefit on the margin to studying hard for it will improve one's job prospects.

Broad spectrum achievement tests covering science, computers, mechanical principles, and technology as well as mathematics, reading and vocabulary are the preferred method of assessing general cognitive skills from the

employer's point of view as well. Test batteries which cover the full spectrum of knowledge and skills taught in high school are more valid predictors of job performance than tests which assess math and verbal skills only. Evidence for this statement comes from examining the relative contributions of various subtests to the total validity of the ASVAB battery. Sims and Hiatt's (1981) analysis of the job performance of 23,061 Marine recruits found, for example, that validity (corrected for restriction of range) was .38 for auto shop information, .43 for mechanical comprehension, .42 for electronics information, .46 for general science, .42 for word knowledge, .50 for mathematics knowledge, and .48 for arithmetic reasoning. Tests measuring electronics, mechanical, automotive and shop knowledge--material that is generally studied only in vocational courses--have high validity. Analyzing this and other military data sets, Hunter, Crosson and Friedman (1985) concluded that the "general cognitive ability" construct that best predicted performance in all military jobs included subtests in general science, electronics information, mechanical comprehension and mathematics knowledge as well as conventional word knowledge, paragraph comprehension and arithmetic reasoning subtests. The addition of these four subtests to the construct increased validity by 9 percent and the proportion of true job performance variance explained from .306 to .364. They also found that auto and shop information significantly improved the prediction of performance in jobs in the mechanical job family. I suspect that tests measuring understanding of statistics, business, economics, marketing and psychology would similarly improve the validity of batteries used to select workers for most white collar jobs in the private sector.

Will the courts allow firms to use broad spectrum achievement tests covering subjects not offered until the final years of high school? My fear

is that, since the research on test validity in the civilian sector has used the GATB almost exclusively, employers may be forced to use reading, vocabulary, and arithmetic reasoning tests that are demonstrably similar to their GATB counterparts. If the studies of the ASVAB's validity in predicting performance in military jobs are not accepted as evidence for similar jobs in the civilian sector, it might be a decade before tests measuring general science and electronics knowledge could be used as a general selection device for blue collar jobs. Courts might require that employers demonstrate that each item on a science test have a specific application in each job for which it is a proposed selection device. To avoid having to redesign the test for each job, test developers would dumb the test down and include only simple questions covering scientific principles that are learned in elementary school. Costly validity studies covering tens of thousands of workers might be necessary before broad spectrum achievement tests covering the material included in rigorous high school courses have their validity generalized and become available as selection tools.

In Japan and many European countries, the educational system administers achievement test batteries (eg. the 'O' Levels in the UK, the Baccalaureate in France) which are closely tied to the curriculum. Because they generate credentials which signal academic achievement to all employers and not just the employers who choose to use employment tests, these school sponsored achievement tests have much stronger incentive effects than greater employer use of achievement tests will have in the US. Employer administered achievement tests have weaker incentive effects than school sponsored exams but they are nevertheless desireable if the credentials awarded by schools do not signal a student's true academic achievements.

To maximize the incentive effects, it is essential that students, parents and teachers be aware that local employers are using tests for selection and what kind of material is included on these tests. Employers should seek out ways of publicizing their use of broad spectrum achievement tests. Unfortunately, the fear of litigation may cause employers to give only limited publicity to their use of tests and so constrain the type of tests that are used that many of the potential beneficial incentive effects of employment testing may never be realized.

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